

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 H05K3/40 H05K3/38

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 H05K

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, PAJ, WPI Data, IBM-TDB

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 4 386 116 A (NAIR ET AL.) 31 May 1983 (1983-05-31) claims; figures ---	1-5
A	EP 0 255 911 A (IBM) 17 February 1988 (1988-02-17) claims; figures ---	1-5
A	37306: "PROCESSES FOR MANUFACTURING MULTILAYER TAB" RESEARCH DISCLOSURE, GB, INDUSTRIAL OPPORTUNITIES LTD. HAVANT, no. 373, 1 May 1995 (1995-05-01), pages 303-307, XP000518622 ISSN: 0374-4353 the whole document -----	1, 3-5

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

* Special categories of cited documents:

- *A* document defining the general state of the art which is not considered to be of particular relevance
- *E* earlier document but published on or after the international filing date
- *L* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- *O* document referring to an oral disclosure, use, exhibition or other means
- *P* document published prior to the international filing date but later than the priority date claimed

- *T* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- *X* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- *Y* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- * & * document member of the same patent family

Date of the actual completion of the international search

23 February 2001

Date of mailing of the international search report

02/03/2001

Name and mailing address of the ISA

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Authorized officer

Mes, L

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US 00/ 30015

Box III TEXT OF THE ABSTRACT (Continuation of item 5 of the first sheet)

The present invention provides a multi-layer double-sided wiring board which provides excellent adhesion between the conductive layer(12) and the insulating layer(10) because of the provision of an interface layer(14) therebetween, and which exhibits excellent conductivity reliability because the upper and lower conductive layers(16,12) are joined together within the blind via(18) without interposing a dissimilar metal.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/US 00/30015

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
US 4386116	A	31-05-1983	DE 3279492 D	06-04-1989
			EP 0083020 A	06-07-1983
			JP 1469288 C	30-11-1988
			JP 58115889 A	09-07-1983
			JP 63017358 B	13-04-1988
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EP 0255911	A	17-02-1988	JP 63041049 A	22-02-1988
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PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference 55166PCT7A	FOR FURTHER ACTION see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, item 5 below.	
International application No. PCT/US 00/ 30015	International filing date (day/month/year) 31/10/2000	(Earliest) Priority Date (day/month/year) 05/11/1999
Applicant 3M INNOVATIVE PROPERTIES COMPANY		

This International Search Report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This International Search Report consists of a total of 3 sheets.

☒ It is also accompanied by a copy of each prior art document cited in this report.

1. Basis of the report

- a. With regard to the **language**, the international search was carried out on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.

☐ the international search was carried out on the basis of a translation of the international application furnished to this Authority (Rule 23.1(b)).

- b. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international search was carried out on the basis of the sequence listing :

☐ contained in the international application in written form.

☐ filed together with the international application in computer readable form.

☐ furnished subsequently to this Authority in written form.

☐ furnished subsequently to this Authority in computer readable form.

☐ the statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.

☐ the statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished

2. ☐ **Certain claims were found unsearchable** (See Box I).

3. ☐ **Unity of invention is lacking** (see Box II).

4. With regard to the **title**,

☒ the text is approved as submitted by the applicant.

☐ the text has been established by this Authority to read as follows:

5. With regard to the **abstract**,

☐ the text is approved as submitted by the applicant.

☒ the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. The figure of the **drawings** to be published with the abstract is Figure No.

☒ as suggested by the applicant.

☐ because the applicant failed to suggest a figure.

☐ because this figure better characterizes the invention.

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☐ None of the figures.

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INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

2



Applicant's or agent's file reference Hi-bu 010949wo	FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. PCT/US00/30015	International filing date (day/month/year) 31/10/2000	Priority date (day/month/year) 05/11/1999
International Patent Classification (IPC) or national classification and IPC H05K3/40		
Applicant 3M INNOVATIVE PROPERTIES COMPANY et al.		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.
2. This REPORT consists of a total of 6 sheets, including this cover sheet.
 - ☐ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of sheets.

3. This report contains indications relating to the following items:

- I ☒ Basis of the report
- II ☐ Priority
- III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV ☐ Lack of unity of invention
- V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☐ Certain documents cited
- VII ☒ Certain defects in the international application
- VIII ☒ Certain observations on the international application

Date of submission of the demand 26/04/2001	Date of completion of this report 08.01.2002
Name and mailing address of the international preliminary examining authority:  European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized officer Batev, P Telephone No. +49 89 2399 7970 

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT**

International application No. PCT/US00/30015

I. Basis of the report

1. With regard to the **elements** of the international application (*Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17)*):

Description, pages:

1-8 as originally filed

Claims, No.:

1-5 as originally filed

Drawings, sheets:

1/4-4/4 as originally filed

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
- ☐ the claims, Nos.:

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT**

International application No. PCT/US00/30015

☐ the drawings, sheets:

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)

6. Additional observations, if necessary:

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	1 - 5
	No:	Claims	none
Inventive step (IS)	Yes:	Claims	1 - 5
	No:	Claims	none
Industrial applicability (IA)	Yes:	Claims	1 - 5
	No:	Claims	none

2. Citations and explanations
see separate sheet

VII. Certain defects in the international application

The following defects in the form or contents of the international application have been noted:
see separate sheet

VIII. Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:
see separate sheet

Re Item VIII

Certain observations on the international application

1. From the expression "an interface layer interposed between the insulating layer and the first and second conductive layers" in claim 1 it is not clear if the interface layer is interposed between the insulating layer and the first conductive layer or between the insulating layer and the second conductive layer.
2. The subject matter of the claims should be defined by means of positive features (see Guidelines, Chapter III-4.12). Contrary to this requirement, the expression "without the interface layer being interposed therebetween" is used in claims 1 and 2.
3. It appears that the terminology used is not consistent throughout the description and the claims (Rule 10.2 PCT). More than one term is used for each one of the technical features denoted by the same reference sign: "insulating layer", "polyimide film", "polyimide" and "polyimide layer" (10); "metal layer" and "conductive layer" (16); "resist pattern" and "lower resist" (28).

Re Item V

Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

Reference is made to the following documents cited in the ISR:

- D1: 37306: 'PROCESSES FOR MANUFACTURING MULTILAYER TAB'
RESEARCH DISCLOSURE, GB, INDUSTRIAL OPPORTUNITIES LTD.
HAVANT, no. 373, 1 May 1995 (1995-05-01), pages 303-307, XP000518622
ISSN: 0374-4353
- D2: US-A-4 386 116 (NAIR ET AL.) 31 May 1983 (1983-05-31)
- D3: EP-A-0 255 911 (IBM) 17 February 1988 (1988-02-17)

Insofar as the examiner can understand the claims, the following is pointed out:

1. The present invention relates to a multi-layer double sided wiring board (claim 1) and a method of fabricating the same (claims 4 and 5).

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT - SEPARATE SHEET**

International application No. PCT/US00/30015

2. The object of the invention (see p.2, l.26-31 of the description) is to provide a multi-layer double-sided wiring board having good adhesion between the lower conductive layer and the insulating layer, and good conductivity between the upper and the lower conductive layer in a blind via.

3. Document D1 relates like the present application to multi-layer double-sided wiring boards and processes for their fabricating.

The solution as proposed in claim 1 is distinguished from the wiring boards known from D1 in that the second conductive layer directly contacts the first conductive layer in the opening formed in the insulating layer. According to D1 the two conductive layers contact in the opening through a layer of chrome and copper.

The subject matter of claim 1 appears, therefore, novel (Article 33(2) PCT).

4. The other cited documents D2 and D3 both relate to a metallized ceramic polyimide structure and do not give an incitement to the specific solution defined in claim 1.

In view of the available prior art, the subject matter of claim 1 seems, therefore, inventive (Article 33(3) PCT).

5. Claims 2 and 3 which define preferred embodiments of the invention are dependent on claim 1 and as such also meet the requirements of the PCT in respect of novelty and inventive step.

6. Independent claims 4 and 5 both define a method of fabricating the multi-layer double-sided wiring board of claim 1. Consequently, said claims also meet the requirements of the PCT in respect of novelty and inventive step.

7. The industrial applicability of the invention is obvious from the disclosed embodiments.

Re Item VII

Certain defects in the international application

1. Contrary to the requirements of Rule 5.1(a)(ii) PCT, the relevant background art disclosed in the document D1 is not mentioned in the description, nor is this document

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT - SEPARATE SHEET**

International application No. PCT/US00/30015

identified therein.

2. The features of the claims are not provided with reference signs placed in parentheses in order to facilitate their understanding (Rule 6.2(b) PCT).

3. Independent claims 1, 4 and 5 are not in the two-part form in accordance with Rule 6.3(b) PCT, which in the present case would be appropriate, with those features known in combination from the prior art (D1) being placed in the preamble (Rule 6.3(b)(i) PCT) and with the remaining features being included in the characterising part (Rule 6.3(b)(ii) PCT).
